

AMENDMENTS TO THE CLAIMS:

Please amend the claims as follows:

1. (Currently Amended) An electric charge transfer apparatus, comprising:

a plurality of columns of vertical charge transfer devices, each of which is formed adjacent to each column of a plurality of photoelectric conversion elements ~~element~~ and transfers a signal electric charge converted by the photoelectric conversion element;

a plurality of charge-discharging circuit sets each formed next to each column of the vertical transfer devices device at an end of each column of the vertical transfer devices near an horizontal charge transfer device, each charge-discharging circuit set including at least two charge-discharging circuits connected in a serial manner for discharging the signal electric charge transferred by at least one of adjacent vertical transfer devices;

the horizontal charge transfer device being formed at a lower end of the columns of the vertical charge transfer devices and connected at one end thereof with an output circuit; and

wherein the an output circuit outputs the signal electric charge transferred by the vertical charge transfer devices to an outside of the electric charge transfer apparatus.
2. (Withdrawn) An electric charge transfer apparatus according to claim 1, wherein

said vertical charge transfer devices are configured in parallel to each other; and

a charge-discharging direction of at least one of the charge-discharging circuits formed next to each vertical transfer device is an opposite direction of a charge-

discharging direction of other charge-discharging circuits formed next to the same vertical transfer device.

3. (Withdrawn) An electric charge transfer apparatus according to claim 1, wherein said charge-discharging circuit comprises an overflow drain shared with other charge-discharging circuit corresponding to the same vertical charge transfer device.

4. (Withdrawn) An electric charge transfer apparatus according to claim 3, wherein a number of said overflow drain is about a half of a number of columns of the said vertical transfer devices.

5. (Withdrawn) An electric charge transfer apparatus according to claim 1, wherein said charge-discharging circuit comprises a control gate that controls discharging of electric charge independently from other charge-discharging circuit corresponding to the same vertical charge transfer device.

6. (Currently Amended) A solid-state imaging device, comprising:

a semiconductor substrate;

a plurality of photoelectric conversion elements formed on said semiconductor substrate;

a plurality of vertical charge transfer devices formed above said semiconductor substrate, each of which is formed adjacent to each of the photoelectric conversion element and transfers signal electric charge photoelectric converted by the photoelectric conversion element;

a plurality of charge-discharging circuit sets formed next to each vertical transfer device at an end of each of the vertical transfer device near a horizontal charge transfer circuit, each charge-discharging circuit set including at least two charge-discharging circuits connected in a serial manner for discharging the signal electric charge converted by the photoelectric conversion element at a predetermined position and transferred by at least one of adjacent vertical transfer devices;

the horizontal charge transfer device being formed at a lower end of the vertical charge transfer devices and connected at one end thereof to an output circuit; and

wherein the an output circuit outputs the signal electric charge transferred by the vertical charge transfer devices to outside.

7. (Withdrawn) An electric charge transfer apparatus according to claim 6, wherein said vertical charge transfer devices are configured in parallel to each other; and a charge-discharging direction of at least one of the charge-discharging circuits formed next to each vertical transfer device is an opposite direction of a charge-discharging direction of other charge-discharging circuits formed next to the same vertical transfer device.

8. (Withdrawn) An electric charge transfer apparatus according to claim 6, wherein said charge-discharging circuit comprises an overflow drain shared with other charge-discharging circuit correspond to the same vertical charge transfer device.

9. (Withdrawn) An electric charge transfer apparatus according to claim 8, wherein a number of said overflow drain is about a half of a number of columns of the said vertical transfer devices.

10. (Withdrawn) An electric charge transfer apparatus according to claim 6, wherein said charge-discharging circuit comprises a control gate that controls discharging of electric charge independently from other charge-discharging circuit corresponding to the same vertical charge transfer device.

11. (Withdrawn) An electric charge transfer apparatus, comprising:

a plurality of vertical charge transfer devices, each of which has plural lines of charge transfer electrodes and transfers signal electric charge;

a plurality of charge-discharging circuits arranged to each line of the charge transfer electrodes, each of the charge-discharging circuit selectively discharging the signal electric charge transferred by the vertical charge device to a discharging direction different from other charge-discharging circuit; and

an output circuit that outputs the signal electric charge transferred by the vertical charge transfer devices to an outside of the electric charge transfer apparatus.

12. (Withdrawn) An electric charge transfer apparatus according to claim 11, wherein

said charge-discharging circuit comprises an overflow drain shared with other charge-discharging circuit corresponding to the same vertical charge transfer device, and

a number of said overflow drain is about a half of a number of columns of the said vertical transfer devices.

13. (Withdrawn) A solid-state imaging device, comprising:

a semiconductor substrate;

a plurality of photoelectric conversion elements formed on said semiconductor substrate;

a plurality of vertical charge transfer device formed above said semiconductor substrate, which transfer signal electric charge photoelectric converted by said photoelectric conversion elements;

a plurality of charge-discharging circuits arranged to each line of the charge transfer electrodes, each of the charge-discharging circuit selectively discharging the signal electric charge converted by the photoelectric conversion element at a predetermined position and transferred by the vertical charge transfer device to a discharging direction different from other charge-discharging circuit; and

an output circuit that outputs the signal electric charge transferred by the vertical charge transfer devices to an outside of the electric charge transfer apparatus.

14. (Withdrawn) An electric charge transfer apparatus according to claim 13, wherein

said charge-discharging circuit comprises an overflow drain shared with other charge-discharging circuit corresponding to the same vertical charge transfer device, and

a number of said overflow drain is about a half of a number of columns of the said vertical transfer devices.

15. (Canceled)

16. (Currently Amended) An electric charge transfer apparatus according to claim 1 ~~[[15]]~~, wherein the horizontal charge transfer device receives the signal electric charge

in parallel from the plurality of vertical charge transfer circuits and transfers the received signal electric charge in sequence to the output circuit.

17. (Previously Presented) An electric charge transfer apparatus according to claim 1, wherein a first of the at least two charge-discharging circuits selectively discharge the signal electric charge from the plurality of vertical charge transfer devices.

18. (Previously Presented) An electric charge transfer apparatus according to claim 17, wherein a second of the at least two charge-discharging circuits discharges the signal electric charge left after the discharging of the first charge-discharging circuit.

19. (New) An electric charge transfer apparatus according to claim 1, wherein a first of the at least two charge-discharging circuits discharges the signal electric charge converted by the photoelectric conversion element at a predetermined position and transferred by at least one of adjacent vertical transfer devices, and a second of the at least two charge-discharging circuit discharging the signal electric charge left by the first charge-discharging circuit.

20. (New) An electric charge transfer apparatus according to claim 6, wherein a first of the at least two charge-discharging circuits discharges the signal electric charge converted by the photoelectric conversion element at a predetermined position and transferred by at least one of adjacent vertical transfer devices, and a second of the at least two charge-discharging circuit discharging the signal electric charge left by the first charge-discharging circuit.